isotherm
® by indel marine

~INSTALLATION AND SERVICE MANUAL

ISOTHERM 4000/5000 W is a modern cooling system for yachts and power boats, using a holding plate for storing the cold energy together with an electronic system, which automatically starts the refrigeration compressor as soon as the engine is running. A large cooling capacity is achieved while at the same time consuming the lowest possible electrical power. The installation is very simple as nothing needs to be connected to the engine nor to the engine cooling water system.

~To achieve maximum efficiency and trouble-free operation, the following points are of vital importance:

A well-insulated ice box is the most important factor for refrigeration efficiency. A top-opening box is better than a front-opening fridge. Expanded or cross-linked PVC or polyurethane material should be used as insulation.

~Recommended insulation thickness:

Boxes 35-75 litres (l-3 cft) volume	~50 mm (2")
Boxes over 75 litres (over 3 cft) volume	75-l 00 mm (3-4")

The boxes should be fitted with a partition, preferrably adjustable,to create a separate space close to the holding plate for freezing. This should not be larger than needed. A tight fitting lid and partition together with good insulation minimizes thermal leakage and keeps the cold in the holding plate longer stored.

It isalso important that the electrical system is in good condition, especially when refrigeration is required for several days without the engine running. Try to estimate the total need onboard for battery capacity. The engine should always have a separate starting battery. A marine battery of 70 Amp. hours should be suitable for the cooling unit plus additional for otherelectrical consumption onboard.

How the ice box is used is also important. Do not put in or take out articles more than necessary and do not have them out of the fridge too long after cooking or having your meal. Thermally it is very uneconomical to stow warm food. A good idea is to use an insulated bag to carry froozen food from home or the shops. This will save battery power. Also, let the engine run a few minutes extra when entering or leaving harbour, as running engine always gives an extra supply of "free" cold.

~MAIN COMPONENTS

COMPRESSOR

The compressor in the ISOTHERM 5000W is of a new highly efficient type. A control box monitors and controls its running conditions. The control box is designed for use in the toughest environmental condtions, and is constructed by using the latest microprocessor technology. It includes high and low voltage protection, polarity protection and a system which ensures a safe compressor start. The compressor unit includes a seawater cooled heat exhanger (condenser), made of a saltwater resistant material. An electrical seawater pump ensures effective cooling during the warmest conditions. This guarantees highest efficiency. The seawater pump is noiseless and of the diaphagm type for optimum life and is also self-priming so that it can be installed above the water line.

~HOLDING PLATE

~The holding plates are made of the highest quality stainless steel. A thermisotor, fitted to the rear of the holding plate, sends temperature information to the system control box. The holding plate is easy to fit in the ice box, and may be fitted in any position - either vertical or horizontal.

$HORE POWER

The availability of 11 O/220 V main power is becoming more and more common in modern marinas. ISOTHERM is especially suited for shore power. By connecting a good battery charger (min 20 A) to the batteries, these will first be charged to their maximum capacity. When the batteries are fully charged, their voltage will increase which the ISOTHERM control box registers. The compressor then starts automatically, and runs continuously until the holding plate is completely frozen out. So when you leave the marina, both the batteries and the cooling plate are “fully carged”. With some new types of battery charger, that is floating around 13 volt, switch the control panel to “Freeze” position.

for cooling the box ISOTHERM will always use the cool stored in the holding plate first, and only when this is used start the compressor for a few minutes in the “economy program”. ISOTHERM is almost noiseless, and its operating life so long that it may be left running continuously when shore power is available.

QUICK COUPLINGS

The quick couplings simplify the connection of the holding plate copper tubing to the compresor unit. The system is prefilled with Freon, and the quick couplings may be taken apart again without the gas leaking out, if for some reason the ISOHERM unit must be removed. To make the installation easy in larger yachts, the tinned tubes are 3 m (9ft.) long for 4000/45OOW and m (11 ft.) for 5000W.

INSTALLATION INSTRUCTIONS

First decide where the various units are best installed. Choose a suitable space for the compressor that can be reached by 3,0/3,5 m copper pipes. This should be positioned so that no sharp bends are required. The space for the compressor unit should not be at a position which can be higher than 2 (65 ft.)metres above waterline. The space choosen should also be easily reached with electric wire of sufficient area. The electronic control unit must be positioned within 0,5 m ft.) of the compressor.

The control panel must be placed so it can be reached by two wires: one from the freezer unit and one from the electronic control unit. (For 5000W also with voltage sensor cable).

compressor unit and the electronic control unit are designed to withstand a marine environment but should obviously be placed in as dry and protected surrounding as possible and with their electrical connections downwards.

The holding plate position in the ice box should be choosen after considering the route for the copper piping, the partition wall, etc.

Only regular hand tools are required for installation. If possible, drill the holes for the copper pipe couplings with a 30 mm (1 t/4") diam. A power wire of suitable diameter and length, screws, etc. are the only additional components required.

PLATE

If the box to be used is already installed, inspect it to establish the quality of its insulation as this is an important factor concerning thermal efficiency.

The holding plate can be placed in any position. The copper pipe is annealed and can easily be bent over the edge of the freezer so that the exit hole can be positioned behind. The four supports give sufficient space for this to be done. Handle the copper pipe with care and bend carefully to avoid creasing it. Use a cylindrical object if shapt bends are required. Be particularly careful with the thin capillary pipe and its coupling at the other end of the copper pipe. The pipes are filled with Freon, a gas which is completely safe in all respects, and these must not be cut or disconnected after assembly. Start by unrolling the pipe to its full extend. Installation of the holding plate is easier if someone can assist: One holds the freezer and directs the pipe through the side of the box while the other feeds the pipe and its two connections through bulkheads, etc.

The holding plaate should be placed high in the box, approx. 100 mm (4") below the top so that the cold air can "fall" into the box. Holes for the pipe and couplings should be drilled to 28-30 mm diam. The hole in the box should be as high up as possible to minimize leakage of cold air. Fill the hole afterwards with insulating material. Any excess pipe should be coiled and fastened to a suitable bulkhead or similar to avoid vibrating.

~PARTITION FOR ADJUSTING TEMPERATURE

Cold air from the freezer unit sinks down to the bottom of the box. The box therefore needs a separate space to enable it to be used as a freezer compartment. To achieve best results this compartement should be no larger than absolutely necessary (max. 30 litres), The dividing partition should rest against the sides of the box and have the same height as almost the top of the freezer unit. It should have an adjustable gas of some millimetres (I/I 6 in.) at the lower edge to allow a suitable amount of cold air to run into the cool section of the box, where a temperature of +4 to +IO "C (40-50 0F) can be maintained. The dividing partition need not to be insulated, be easy to clean and preferably transparent. Plexiglass is a suitable material.

tOMPRESSOR UNIT

The compressor unit can be fitted in a suitable space such as a cupboard, locker, stowage compartment or even high (max. 2 m, 6 ft.) in the bilges of a large, dry boat. It may be beneficial to fit the unit on two strong 90" angle brackets (available as accessories no. 30012) or on a shelf fitted to a bulkhead so as not to loose valuable stowage space, etc. The unit will operate continuously at angles of up to approx. 30 and should therefore be fitted horizontally across the beam of sailing boats so as not to exceed this at full angle of heal. The unit should be attached well to withstand excessive movements.

cleave the protection caps on until it is time to connect the quick couplings. Save the protection caps for future use. The brass screw couplings should be connected and tightened quickly and smoothly so that they first reach their sealing position before the membrane inside is opened. The couplings can be unscrewed after this operation without gas leak ing out. Use two spanners 24 mm for this operating so that the *couplings* will be *carefully and* very hard *tightened.* Be careful so that the female coupling on the thin pipe does not rotate.

It can often'simplify assembly if the screw couplings are tightened *before* the compressor unit is installed in its final position.

~The electronic control unit should be installed with the cables downwards, vertical and with the fuse holder easily accessible.

~If the compressor unit has been fitted in a compartment that is used for other purposes, it may be necessary to protect it from external damage in some way.

~WATER CONNECTION

~The water inlet is to be connected in a position to allow supply of cooling water to the unit even when Mount the compressor well protected but easy to reach and with its suction side connected to the water inlet and its outlet connected to some water hull outlet.

tONTROL PANEL

~The control panel should be fitted where it is easily visible and within reach of the wires from both the freezer and the compressor units, as well as voltage sensor cable for 5000W on ly (see below).

~To remove the panel from its cover, push the sides outwards so that the lips on each side are released. Carefully lift out the panel and circuit board by holding the switch. Drill 4 small holes in each corner for screws to fasten the box in position. Drill holes diamii 15 mm (I/2") in all bulkheads , panels, etc. for the wires and their connectors. It possible to take out the wires downwards if you cut a slit in the bottom of the plastic box.

WIRERING

Carefully plug all the wires connectors into the circuit board. Replace the panel. Fasten the cables in such a way that the connectors will not be damaged.

~The wires from the battery should be of a sufficient area in comparison to the length. A good guide to use is:

2,5 m length: 4 mm2 (AWG #10-8ft.)
4,0 m length: 6 mm2 (AWG #KS -12 ft.)
6,0 m length: 10 mm2 (AWG #6-20 ft.)

~They should be connected directly to the + and · poles of the battery, or better, main switch (preferably by self-tapping screws and soldered wire terminals, etc.) . A good connection here is vital for efficient operation of the system. Connect the + and · cables to the correct position on the control unit.The fuse will cut if polarity is reversed by incorrect connections.

For 5000W you find an additional voltage sensor cable from control panel. This sensor cable should be fitted to some "voltage representative" plus and minus connection, not on the same line as the main power to compressor.

The control panel voltage sensor cable is to be connected to + and · at the switchboard panel or any other suitable connection point by the 2-leads cable with open ends. White cable to -, brown to +.

~The 2-leads cable with a 2-pole connecting plug is connected to the electronic unit and to the overheat cut-out. The thermisor is connected at the two tabs on the control panel.

system must not be connected directly to a battery charger without a battery connected in parallel.

SWAY OF OPERATING

When you put the control panel switch in "Economy" ISOTHERM operates to give a normal refrigerator temperature to minimum power output from batteries. The idea is that the compressor shall run as much as possible when the engine is running and power supply is "free" and then store cooling energy by charging the holding plate. When the engine is not running the compressor shall run as m as possible and start first when all the cooling energy from holding plate is fully used. When voltage is over 13,2 +/-0,2 volt (26,4+/-0,3 volt) the control panel "knows" that the engine is in operation and stops the compressor at -15 "C and starts it again at -8°C. When voltage is under 12,6+/-0,2 volt (25,2+/-0,3 volt) it stops the compressor at -6°C and starts it again at -1 "C. The melting/freezing point is then in the middle of above mentioned areas, i.e. at -7°C. That means when voltage is over 13,2 volt (powered from engine/shore power), the compressor will freeze out the brain in holding plate and make solid ice of it. When voltage is below 12,6 volt (powered from batteries) the compressor will stop before it starts to make ice of the brain.

~lf you put switch in "Freeze" the control panel think that the engine is running even it is not.

~TEST RUN

Set switch to "Normal-Auto" position. The green light will go on immediately and the yellow light after a few minutes.This indicates that the compressor is running. A slight hissing noise will soon be heard from the holding plate but frost will not appear on the plate after 15-30 minutes. Start the engine. After a while (the exact time varies depending on the condition of the generator and battery) the indicator lamps change: The yellow turns off and the red turns on.

When the engine is stopped the reverse will happen. The time it takes before this happens will again depend on the condition of the battery and alternator. The greater the charge in the battery, the longer the red light remains on. These conditions will occur as long as the holding plate has not become really cold.

When the'unit is in "economy" mode but does not "ask" for more.cold the yellow lamp can be lighted very weak.

wafter the test run, check all mechanical and electrical connections and fasten these to bulkheads, etc. so that they are safe and secured.

MAINTENANCE

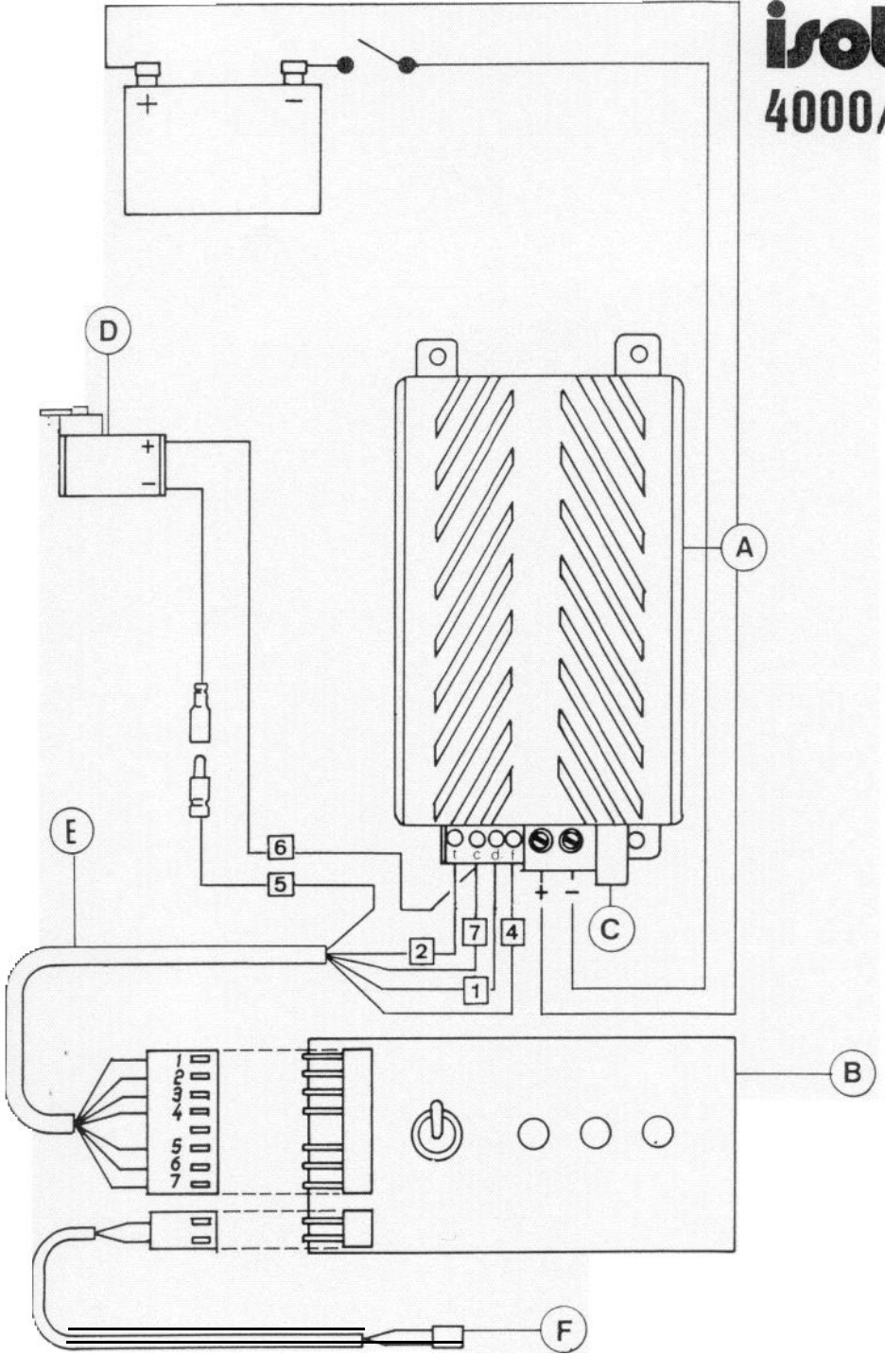
No special maintenance is necessary. The unit can remain in the boat during winter but it is impo&rnt to fill up waterpump and with anti freeze mixture if risk for freezing temperature. Also keep your batteries and electrical system in good condition. When necessary also clean the small filter on the water inlet.

FAULT FINDING CHART

~FAULT	~POSSIBLE CAUSE	FACTION
1. Nothing happens when switched on. No lamps light.	No power supply.	Is main switch on? Check fuse in electronic control unit. Have power wires been connected incorrectly?
2. Compressor does not start. Green lamp on.	Holding plate already sufficiently cold. Control unit in blocking state.	Disconnect power for a few seconds.
	Broken connections to temperature sensor in freezer.	Check cable and connections.
	Too low voltage in power supply (under 10,5 V).	Check condition of battery.
3. Compressor and pump start and stop when engine is running.	Voltage drop in electrical system.	Area of wires too small. Poor connections. Alternator in poor condition or slipping drive belt.
4. Compressor tries to start every 20 seconds. A weak hissing noise will be heard always when it tries to start.	Pump can not rotate or is faulty.	Check the pump and that power supply is max. 1 ,0 A /0,5 A. Area of wires is too small.
5. Poor cooling effect. Compressor runs too often.	Poor transfer of heat from compressor condenser.	Clean condenser and hoses. Improve water circulation.
	Poor insulation of cold box.	Improve insulation. Insulate cover.
	Cooling medium leakage.	Check that quick couplings are properly tightened. Refill with cooling medium. Freon according the sign on compressor,
6. No indication of “Freeze” on control panel when engine starts.	Alternator in poor condition. Incorrectly adjusted charging relay.	Check charging rate. Compensate for battery splitting diodes if fitted.
	Alternator does not come up to speed.	Adjust or replace drive belt.
7. Compressor and pump continue running after engine is stopped.	Battery voltage still high.	Normally a sign that batteries are in good condition. Check that compressor stops at 12,6 +I-0,2 V V when cooling plate frozen.
8. Frost on pipe to holding plate.	System slightly overfilled with Freon.	Let out some Freon from service valve. Pipe can be insulated or redirected inside refrigerator.

isotherm

4000/4500 W



A Styrsystem – Electronic unit -Steuergerat – Systeme electronique

B Manoverpanel -Control panel – Schaltkasten – Boitier de commande

C Sakring 15A-Fuse15Amp.-Sicherung 15A-Fusible 15 A

D Vattenpump-Water pump-Wasser pumpe- Pompe Zl eau

E Manoverpanelkabel -Cable for control panel – Schaltkastenkabel -Cable pour le boitier de commande

F Termistor -Thermistor-Thermistor -Thermistor

Fargkod for maniiverpanelkabel
Colour coding for control panel cable
Couleurs des fils electriques du cable pour le boitier de commande
Farbkennzeichnungen der Schaltkastenkabel

1. Gul-Yellow-Gelb-Jaune
2. Gr&-Grey-Grau-Gris
3. Gron-Green-Grfin-Vet-t
4. Brun – Brown – Braun – Marron
5. Rosa-Pink-Rosa-Rose
6. BH-Blue-Blau-Bleu
7. Vit – White- Weiss- Blanc

Isotherm *5000W/5500W*

Wiring diagram electronic box NIk TIl Part no. 39519 - 12 Volt, 39520 - 24 Volt

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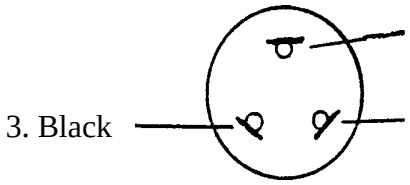
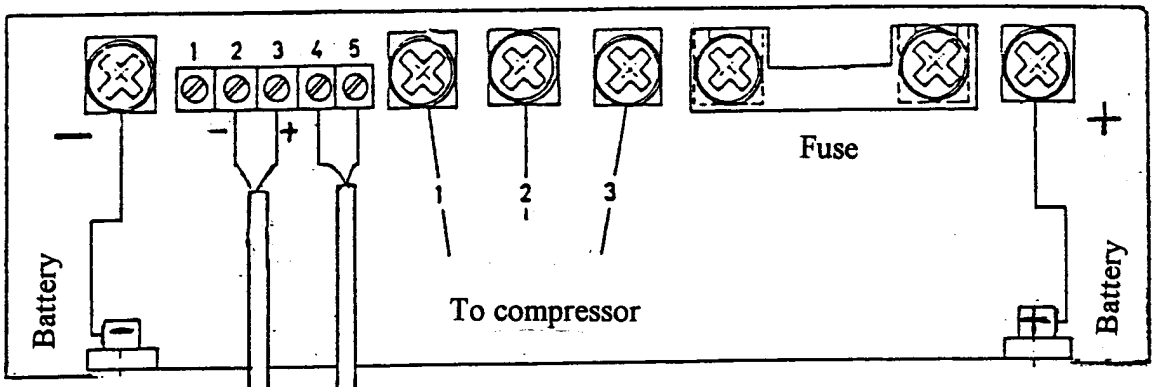
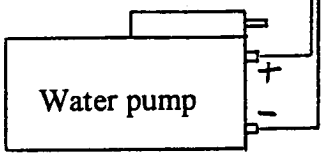
Compressor connection



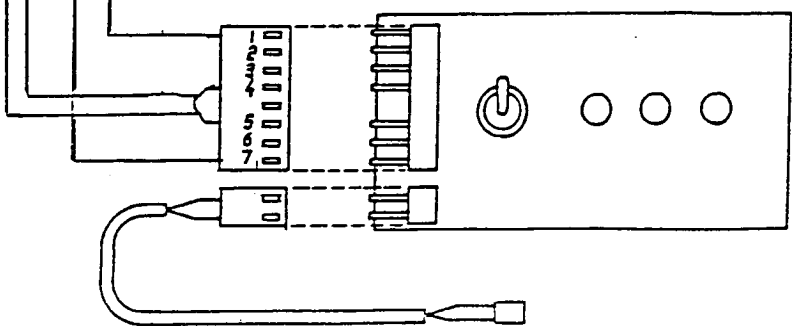


Cable area from electronic box to battery: Less than 4 m (12 ft) : 6mm2
4 - 6 m (12 - 18 ft) : 10 mm2



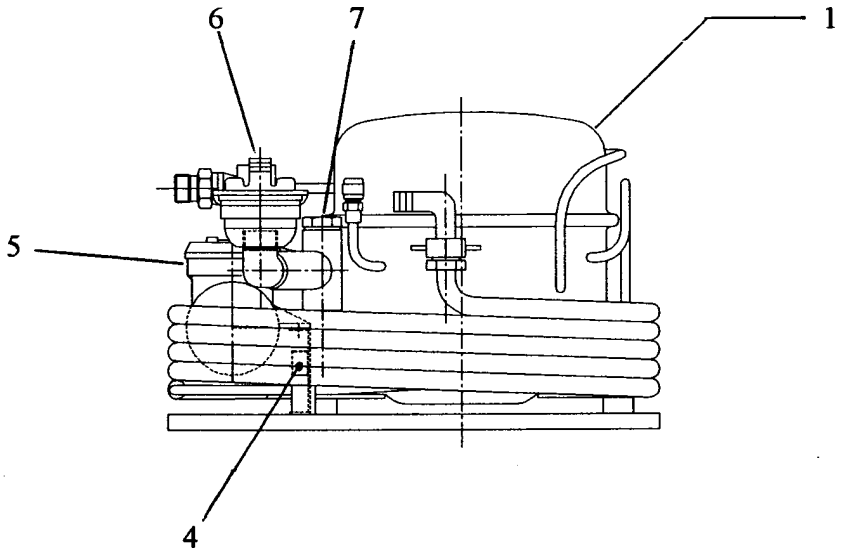
Voltage sensor

Voltage sensor lead to be connected to the electrical system, e.g. at the switchboard. Do not connect to the same cables as the compressor supply cables.



Temp. sensor on holding plate

Isotherm 5000W 5500W 1998 to 1994 MAC Compressor R-12



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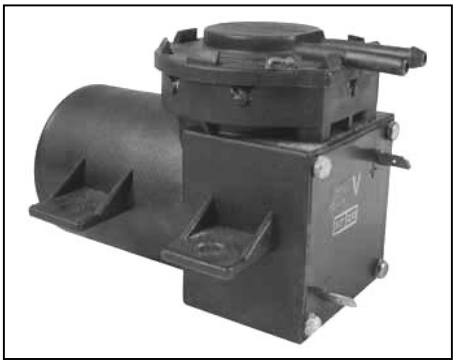
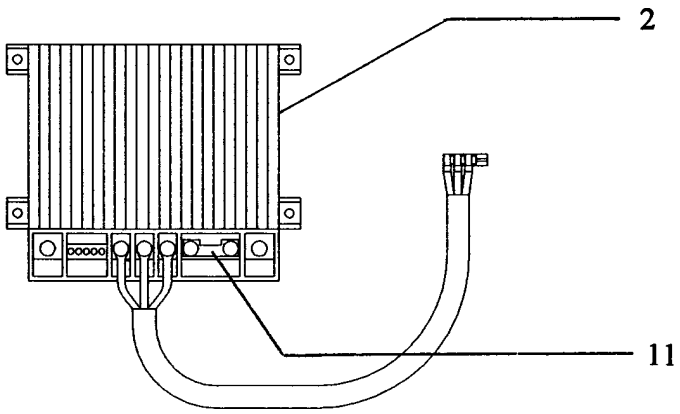
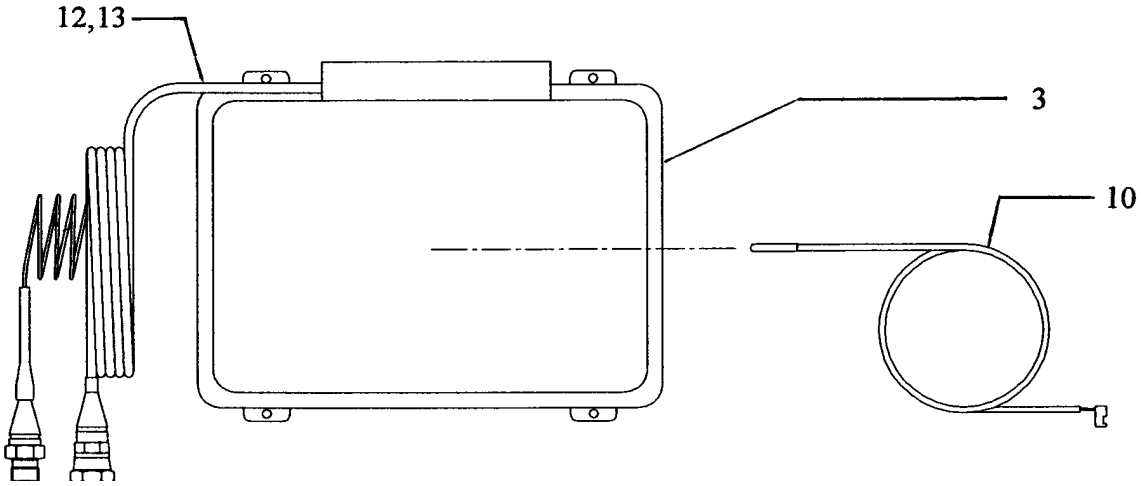
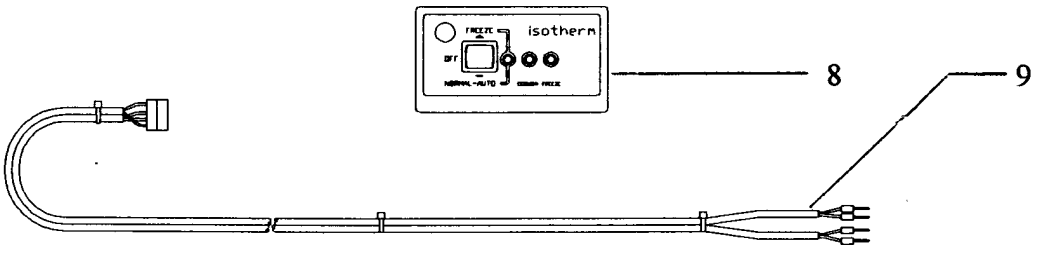
Pump !5-E 39510









1a	=> *SIN* 5999 (1988 - 1991) Compressor unit including condenser, bracket, Fuko quick couplings, excl. electronic unit.	1	12 Volt: 39501 24 Volt: 39502
1b	*SIN* 6000 => (1992 - 1994) Compressor unit including condenser, bracket, Aeroquip quick couplings, excl. electronic unit.	1	12 Volt: 39501 12 Volt: 39502
2	Electronic unit 70 Hz	1	12 Volt: 39519 24 Volt: 39520
3	Holding plate	1	*5001W/5002W:* 39506 (355x280) *5501W/5502W:* 39537 (400x320)
4	Resistance for waterpump, only for 24 Volt	1	39512
5	Water pump	1	39510
6	Water filter	1	39518
7	Zinc anode WI	1	39536
8	Control panel	1	12 Volt: 39508 24 Volt: 39509
9	Controle cable	1	39514
10	Temperature sensor with cable 2.5 m	1	39008
11.	Main fuse	1	12 *V/50* A: 39521 24 *V/30* A: 39522
12	Connection pipe complete with AQ couplings	1	39017
13	Connection pipe complete with Fuko couplings	1	39018